NOTICE OF A NEW COELACANTH FISH FROM THE IOWA KINDERHOOK

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The family of Coelacanth ("hollow spined") ganoids, first proposed by Agassiz in 1844, and subsequently emended by Huxley in two important memoirs of the *Geological Survey of the United Kingdom* (Decades X and XII), is at present understood as comprising not more than six satisfactorily known genera, among which Coelacanthus itself, Macropoma, and Undina are of paramount importance. The first-named of these, which is typical of the family and likewise of the group Actinistia, enjoys the truly remarkable geological range from the Upper Devonian to the close of the Paleozoic, or, if the evidence of certain doubtful indications be accepted, possibly even higher; the remaining genera continue throughout the Mesozoic, and exhibit such constancy of structural characters as to render the family one of the most compact and well defined in the animal kingdom.

Attention has frequently been called to the extraordinary conservatism and persistency maintained by the group throughout an unusually long life-period. Its singular history impressed both of the distinguished naturalists to whom we owe our principal knowledge of the family, Huxley's views upon the matter being thus stated by him:

> Bearing in mind the range of the Coelacanths from the Carboniferous [since ascertained to extend from the Devonian] to the Chalk formations inclusive, the uniformity of organization of the group appears something wonderful. I have no evidence as to the structure of the base and side-walls of the skull in Coelacanthus, but the data collected together in the present Decade shows that, in every other particular save the ornamentation of the fin-rays and scales, the organization of the Coelacanths has remained stationary from their first recorded appearance to their exit. They are remarkable examples of what I have called elsewhere "persistent types," and like the Labyrinthodonts, assist in bridging over the gap between the Paleozoic and the Mesozoic faunae.[1]

[1] *Mem. Geol. Surv. United Kingdom*, Decade XII (1866); reprinted in the supplementary volume of the *Scientific Memoirs of T. H. Huxley* (1903), p. 65.

The earliest known representative of the family is a small form occurring in the lower part of the Upper Devonian near Gerolstein, in the Eifel District, first described by A. von Koenen[1] in 1895, and referred by him with some hesitation to Holoptychius, but afterward recognized by Smith Woodward[2] as an undoubted Coelacanth, and transferred by him to the typical genus. Prior to this discovery the opinion had been generally entertained that, owing to the sudden appearance of Coelacanth fishes in a complete state of development in the Calciferous sandstones of Scotland, it was necessary to postulate the existence of their ancestors during the Devonian, notwithstanding their apparent failure to be preserved in both Europe and North America. In fact, the oldest remains of Coelacanth fishes hitherto found in this country are in strata of Coal Measure Age, and the few species that are known are poorly or at best indifferently preserved. Under these circumstances it is interesting to record the discovery, made by Dr. Stuart Weller a few years ago, of an unusually perfect example of Coelacanthus from the very base of the Mississippian series near Burlington, Iowa. The exact horizon whence the specimen was obtained is the blue shale bed forming the basal member of the Kinderhook limestone, and designated as No. 1 in the local section whose fauna is analyzed by Dr. Weller in Vol. X of the *Iowa Geological Survey Reports* (p. 69 ff.). In recognition of the important results achieved by the author of *Kinderhook Faunal Studies*, and also as a testimonial of personal regard, we have pleasure in presenting the following description under a specific title dedicated in his honor. It should be stated that the holotype is preserved in the Walker Museum of the University of Chicago, and for the privilege of studying it in behalf of the Iowa Geological Survey the writer desires to express here his indebtedness to Dr. Weller.

Cœlacanthus welleri, SP. NOV.

Holotype, a somewhat imperfect fish, the total length of which to the base of the caudal fin is about 19^{cm}, or a little more than three times the length of the head with opercular apparatus. Trunk

[1] A. Von Koenen, "Ueber einige Fischreste des norddeutschen und böhmischen Devons," *Abhandl. k. Ges. Wiss. Göttingen, phys. Cl.* (1895), Vol. XL, p. 28.

[2] A. S. Woodward, "Note on a Devonian Coelacanth Fish." *Geol. Mag.* (1898), Dec. 4, Vol. V, p. 529.

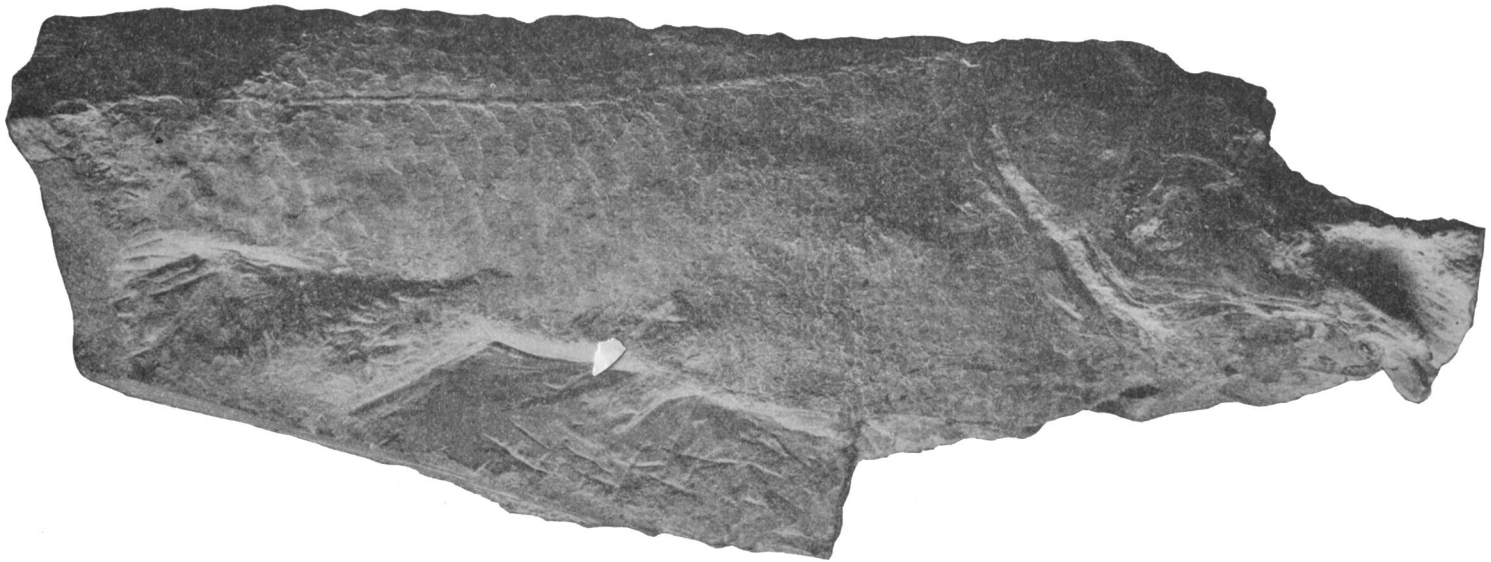

FIG. 1.—*Coelacanthus welleri*, sp. nov. From the basal member of the Kinderhook limestone; Burlington, Iowa. Lateral aspect of holotype showing nearly complete trunk, but deficient as to portions of the head and most of the fin structures, × 1/1.

robust, its maximum depth twice as great as that of the caudal pedicle. Anal and paired fins situated as in the typical species (*C. granulatus* Ag.), the greater part of the caudal and both dorsals not preserved. Operculum and cheek-plates ornamented with numerous fine antero-posteriorly directed spiniform ridges, their position being indicated in the worn condition by faint tubercles. Scales ornamented with numerous fine raised lines of ganoine, more or less continuous and rectilinear in arrangement, but when worn assuming the appearance of elongated tubercles. Lateral line scales with prominent raised tubules directed parallel with the body axis.

The characters serving chiefly to distinguish the present form from other species may be enumerated as follows: (1) The delicate spiniform ornamentation of the operculum and cheek-plates, together with the form and disposition of the latter; (2) the peculiar form of the mandibular ramus; (3) details of superficial scale ornament; and (4) prominence of the lateral line canal. Owing to the defective preservation of most of the fin structures, it is impossible to say in what respects, if any, these differ from the prevailing type. The cranial structure, however, offers a number of interesting points of comparison with other forms, as will be immediately pointed out. Be it noted in passing that the totality of characters by no means indicates a primitive forerunner of the family, but on the contrary bespeaks a typical Coelacanth as completely developed as any subsequent form with which we are acquainted. In this respect the Kinderhook species resembles the only well known British Coelacanth of an age anterior to the Coal Measures, namely *C. huxleyi*, from the Calciferous sandstones of southern Scotland.

With reference to the skull it is to be noted that the cranial roofing-bones are missing in the type specimen, and that a portion of the head in advance of the orbits has been fractured in such manner as to strip off the maxillary and other facial elements, at the same time exposing the anterior spatulate portion of the parasphenoid, together with the steeply inclined triangular palatine plates that abut against it on either side. The inferior border of the palatines, parasphenoid and vomer appears to have suffered somewhat from chemical corrosion, in consequence of which no indications of teeth are anywhere visible. Possibly for the same reason no teeth are to be observed along the

margin of the lower jaw, nor lying free in the matrix, in case any had been broken away.

The mandibular ramus of the right side is well displayed, and the dentary is seen to have been retained in union with its fellow of the left side at the symphysis. The articulo-angular element is long, narrow in front, its superior border rising into a small median and a large posterior elevation, between which is a deep concavity; and its inferior border is nearly rectilinear. The superficial ornament of this piece has become well-nigh obliterated by weathering or abrasion, and of the two gular plates lying immediately underneath, nothing remains but an impression of their inner surfaces.

A notable peculiarity of the form under discussion consists in the arrangement of cheek-plates immediately in advance of the operculum. In all other Coelacanths, so far as known, two subequal postorbital plates are placed one above the other in the space between the orbit and operculum, their position being such as to exclude from contact with the latter the small triangular plate called "postmaxillary" by Huxley. The present species, however, has all three of these cheek-plates situated in vertical series, one overlapping the other from above downwards, and each of them overlapping the anterior border of the operculum. The lowermost cheek-plate, which corresponds to the so-called "postmaxillary" of Huxley, terminates below at a depth equal to that of the inferior border of the operculum, and its superficies covers the space immediately behind the inflected portion of the articulo-angular element of the lower jaw. Its antero-superior margin is apposed to the strongly arched and apparently semicircular suborbital element, of which only a small segment happens to have been preserved.

No indications are to be observed in the type specimen of a sclerotic ring, although one may be inferred to have been present as in other known Coelacanths. Neither is there any external indication of the presence of an ossified air-bladder, peculiar to members of this family. The caudal, anal, and pelvic fins are too imperfectly preserved for description, and the pectoral pair is entirely wanting. On the other hand the squamation is admirably displayed, especially in the posterior part of the trunk, where the fine longitudinal ridges of ganoine and concentric growth-lines are pyritized. The lateral line is rendered

conspicuous by a single large raised tubule of ganoine extending in a horizontal direction for nearly the total length of each scale in this row. The general appearance and some of the details of surface ornament of the type specimen are shown in the accompanying photographic illustration, which we owe to the kindness of Dr. Weller.